

Colbert 7.2.1

QUALITY ASSURANCE AND FIELD SAMPLING PLAN

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COLBERT RESIDENTIAL WELL SAMPLING

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SPOKANE COUNTY
UTILITIES

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPjP) establishes the quality assurance (QA) objectives for the Colbert Residential Sampling Program, and the QA organization and procedures developed to meet project objectives. Guidance used for preparation of this QAPjP is contained in various U.S. Environmental Protection Agency (EPA) documents, including The Quality Assurance Manual for Waste Management Branch Investigations, Region X (EPA 1986b) and A Compendium of Superfund Field Operations Methods (EPA/540/ P-87/001) (EPA 1987a).

The Data Quality Objectives (DQOs) established for this project reflect the intended use of project data and, as such, prescribe the level of quality, accuracy, precision, completeness, comparability, and representativeness of data to be collected and analyzed.

This QAPjP has been prepared by Spokane County and Landau Associates, Inc. (Landau), Spokane County's engineering consultant for design of the Colbert Landfill remedial action. Spokane County will implement this plan and will revise this document, if appropriate.

1.1 PROJECT DESCRIPTION

The Colbert Landfill is located approximately 15 miles north-northeast of Spokane, Washington. The 40-acre landfill was operated from 1968 through 1986, and accepted both municipal and commercial wastes. The landfill is now filled to capacity and is no longer receiving waste.

During the period from 1975 to 1980, a local electronics firm and a nearby military facility used the Colbert Landfill to dispose of spent organic solvents, mainly methylene chloride (MC) and 1,1,1-trichloroethane (TCA), at an average rate of several hundred gallons per month. In 1980, concern over these disposal practices led to the analysis of ground water samples collected from nearby private wells. The results

indicate that some of the wells are contaminated with TCA. Other organic solvents have also been detected in the ground water near the landfill, including: trichloroethylene (TCE), tetrachloroethylene (PCE), 1,1-dichloroethylene (DCE), and 1,1-dichloroethane (DCA). These six chlorinated volatile organics are referred to as the "constituents of concern."

Beginning in 1980, several studies were conducted to determine the nature and extent of ground water contamination emanating from the Colbert Landfill. These studies have identified a contaminant plume moving to the south in an upper sand and gravel aquifer, and another plume moving predominantly to the west in a lower aquifer. Both aquifers are used as sources of drinking water for many residents in the vicinity of the site; however, many of these residents are now receiving drinking water from other sources.

A Remedial Investigation and Feasibility Study (RI/FS) were conducted in 1985 and 1986, respectively, and final reports were released for public comment in May 1987 (Golder and EnviroSphere 1987). The Record of Decision (ROD) for the interim final remedial action was released for public comment in September 1987 (EPA 1987b), and contains detailed information on the site and the selected remedial action. The selected remedial action, or cleanup alternative, will intercept the advance of the contaminant plumes by extracting contaminated ground water and then treating it to remove the organic solvents.

Subsequent to implementation of the ROD, a Consent Decree (U.S. District Court 1989) was negotiated between the regulatory authorities (EPA and Washington State Department of Ecology [Ecology]), Spokane County (County), and the Key Tronic Corporation. By this action, the County agreed to conduct the EPA-selected remedy at the site in accordance with the 1980 Comprehensive Environmental Response Compensation and Liability Act (CERCLA) requirements (as amended by the Superfund Amendments and Reauthorization Act, 1986) and the Washington State Hazardous Waste Cleanup Act, codified as 70.105B RCW.

In 1980 nearby residents complained to the Eastern Regional Office of the Washington Department of Ecology (Ecology) about these disposal practices. State and county officials, under the lead of the Spokane County Utilities Department, initiated an investigation into complaints of ground water contamination in the area by sampling nearby private wells of which some were found to be contaminated with solvents. Subsequently, the County and Key Tronic instituted and continued a well sampling plan to protect the interests of local residents.

In the following years, a number of studies have been directed toward the contamination problem at the Colbert Landfill.

1.2 PROJECT OBJECTIVES

Monitoring of domestic wells in the vicinity of the Colbert Landfill will be conducted to evaluate the progress of the Remedial Action and to identify wells that exceed Performance Standards, so that alternative drinking water supplies may be provided. The domestic well monitoring program described in this section is a continuation of the domestic well sampling program currently being accomplished by the County. This program is being conducted under the review of the Colbert Landfill Ground Water Sampling Committee.

2.0 PROJECT QUALITY ASSURANCE ORGANIZATION AND RESPONSIBILITIES

The project QA organization, showing individuals with QA responsibility and lines of QA authority, is shown on Figure QA-2.1.

FIGURE QA-2.1 Project Quality Assurance Organization

3.0 DATA QUALITY OBJECTIVES FOR PARCC PARAMETERS

The purpose of this section is to describe DQOs for precision, accuracy, representativeness, completeness, and comparability (PARCC) of project data. Specific procedures to be used for sampling, chain of custody, calibration, laboratory analysis, reporting, internal quality control, audits, preventative maintenance, and corrective action are described in other sections of this QAPjP. Detection limits are discussed in Section 7.0.

Samples will be analyzed in accordance with accepted analytical procedures. These procedures were selected from published EPA methods contained in the following documents: SW-846 Test Methods for Evaluating Solid Waste, Third Edition (EPA 1986a) and Standard Methods for the Examination of Water and Wastewater (APHA-AWWA-WPCF 1985).

3.1 PRECISION AND ACCURACY

Precision is a measure of mutual agreement among individual measurements of the same property under prescribed conditions. It is expressed as a standard deviation or relative percent difference. Accuracy is the degree of agreement of a measurement (or an average of measurements of the same property), X , with an accepted reference or true value, T . Accuracy can be expressed as the difference between the two values ($X-T$), the difference as a percentage of the reference or true value ($100 (X-T)/T$), or as a ratio (X/T). Accuracy is a measure of the bias in a system and will be expressed as the percent recovery of spiked samples.

Accuracy and precision are determined through quality control parameters such as surrogate recoveries, matrix spikes, matrix spike duplicates, quality control (QC) check samples, and blind field duplicates. The project data quality objectives for the evaluation of these parameters are based on those given in the EPA method or on functional guidelines outlined by the EPA for evaluating inorganic and organic analyses (EPA 1988a, 1988b). QC objectives (control limits expressed as percent) for surrogate recoveries, and percent recovery and relative percent difference (RPD) for matrix spikes and matrix spike duplicates for this project are listed in Tables QA-3.1 and QA-3.2. Control limits listed in these tables are consistent with EPA guidelines contained in the specific methods. These control limits will be used as criteria for data acceptance. If the required quality control limit for replication or recovery is not met, corrective action will be performed by the laboratory following the guidelines presented in Section 13. If the corrective action is performed and QC objectives still are not met, Spokane County will be notified by the laboratory prior to data submittal, so that additional corrective

TABLE QA-3.1
SURROGATE RECOVERY CONTROL LIMITS

Surrogate Name	<u>Control Limits (percent)</u>
VOAs by GC	
Matrix: Water	
bromochloromethane	68-120
bromofluorobenzene	68-120

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TABLE QA-3.2

LABORATORY MATRIX SPIKE MATRIX SPIKE DUPLICATE CONTROL LIMITS

	Control Limits	
	Recovery (percent)	RPD ^(a) (percent)
VOAs by GC		

Matrix: Water		
1,1-Dichloroethylene	61-145	20
Trichlorethylene	69-123	20

(a) RPD = Relative Percent Difference.

action can be taken, if appropriate. Such action may include reanalysis of the sample or other determination to be made by Spokane County.

In addition to spikes and matrix spike duplicates, QC samples for verification of precision and accuracy include QC check samples and blind field duplicates. Acceptance criteria for volatile organics QC check samples are given in Method 8010. If the sample concentration is greater than five times the project's Contract Required Detection Limit (CRDL), quality control objectives for blind field duplicates will be a Relative Percent Difference (RPD) of ± 20 percent for inorganic or organic analysis of water. If the sample concentration is less than five times the project's CRDL, then the acceptance criteria will be \pm CRDL.

If results for the QC check samples or blind field duplicates are outside the control limits, corrective action and/or data qualification requirements will be determined on a case-by-case basis by Spokane County. The matrix of the QC check samples may not match the field sample matrix and blind field duplication can be poor due to sample inhomogeneity. Therefore, corrective action will be determined by Spokane County and discussed in the data QA report.

3.2 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent an actual condition or characteristic of a population. Sample locations and field sampling procedures have been chosen to maximize representativeness. The degree of representativeness will be measured by repetitive measurements of the same parameter at the same sampling location over several distinct sampling events. The potential effect of seasonal variations and sampling on accuracy will also be considered with respect to representativeness.

3.3 COMPLETENESS

Completeness is a measure of the proportion of data specified in the sampling plan which is determined to be valid. The QA objective for completeness during this project will be 90 percent.

3.4 COMPARABILITY

Comparability is an expression of the confidence with which one data set can be compared to another. All measurements will be made so that results are consistent and representative of the media and conditions measured. All data will be calculated, qualified, and

reported in units consistent with EPA guidelines. Method detection limits and units to be reported are described in Section 7.0 of this document.

4.0 SAMPLING PROCEDURES AND HANDLING

4.1 SAMPLING SITE SELECTION

Ground water sampling locations were selected based on either their proximity to known or suspected contaminant plumes, or their representativeness in characterizing site hydrogeology.

4.2 SAMPLING PROCEDURES

Table QA-4.1 presents matrix group, sample bottle identification code, sample chemical analyses, sample containers to be used, sample preservation methods, and maximum holding times.

4.3 CHAIN-OF-CUSTODY PROCEDURES

Sample control and chain-of-custody procedures are addressed in Section 5.0.

4.4 SAMPLE DOCUMENTATION

Sample documentation will comply with procedures contained in Section 4.6 of A Compendium of Superfund Field Operations Methods (EPA 1987a). Project sampling and sample handling will be documented through the use of the records summarized in Table QA-4.2.

4.5 LABORATORY COORDINATION AND REPORTING

The analytical laboratory will perform chemical analysis of ground water samples. A Spokane County representative will coordinate sampling activity with the laboratory to assure that all samples can be processed within the required holding times. (Actual holding times will be verified by review during data validation as described in Section 8.0).

TABLE QA-4.1

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Matrix	Bottle ^(a) Code	Analyses	Sample Container	Preservation	Holding ^(b) Time
Ground Water	V	Volatiles	2 ea - 40 mL glass vials (leave no headspace) Teflon-lined septum cap	Cool, 4° C	14 days

(a) Bottle code to follow sample station number.

(b) Holding times are from date of collection. All samples will be shipped to the laboratory within 24 hours (except as noted for samples collected on Friday).

TABLE QA-4.2

SAMPLING AND SAMPLE HANDLING RECORDS

Record	Use	Responsibility/Requirements
Field Log Book	Record significant events, observations and measurements.	Maintained by Spokane County Field Representative; must be bound; all entries factual, detailed, and objective; entries must be signed and dated.
Sample Collection Form	Provide a record of each sample collected	Completed, dated, and signed by Spokane County Field Representative; maintained in project file.
Log of Exploration Form	Record geologic and ground water table data during field explorations; used to develop final logs of borings and well logs.	Completed by Spokane County Field Representative; maintained in project file.
Sample Label	Accompanies sample; contains specific sample identification information.	Attached to sample container by analytical laboratory and completed by sampler.
Chain-of-Custody Record	Seals sample shipment container to prevent tampering of sample transference.	Completed, signed, and applied by sampler at time samples are transported.
Sample Analysis Request Packing List	Provides a record of each sample number, date of collection/transport, sample matrix, analytical parameters for which samples are to be analyzed, and condition of samples on receipt at laboratory.	Completed by sampler at time of sampling transport; carbonless copies distributed to laboratory (2) and Spokane County project file (1).

5.0 SAMPLE CUSTODY

Chain of Custody relative to the collection of samples begins in the field. As such the appropriate documentation is initiated at the time of collection. The information submitted to the laboratory with the samples includes specific sample identification data. The initials of the sampler, time and date of collection and the analyses is required. A record of the chain of custody along with the sample results are kept in permanent files by both the laboratory and Spokane County or their agent.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

6.1 LABORATORY INSTRUMENTS

Laboratory instruments will be calibrated and their performance evaluated in accordance with procedures in the EPA method cited. Instrument performance will be evaluated against appropriate check standards and calibration blanks for each parameter prior to commencing actual analysis on each day the analysis is performed. Divergence from benchmark criteria (as defined in the above methods) will be corrected prior to analysis.

For volatile organics analysis in water, the gas chromatograph (GC) will be calibrated initially for each analyte with a 5-point calibration using concentrations established according to guidelines in the method. Linearity must be established by a variation of less than 20 percent Relative Standard Deviation (RSD) in the calibration factor throughout the working range. The calibration will be verified each day using one or more calibration standards, and must vary less than 15 percent from the initial calibration. Continuing calibration will be performed throughout the day using a mid-level standard and will vary less than 15 percent from the initial calibration factors. Retention time windows will be established for each analyte according to Method 8010. These retention time windows will be updated daily according to the method and all continuing standards must fall within the windows.

After calibration and standardization of instrumentation are within acceptable limits, precision and accuracy will be evaluated by analyzing a QC check sample for each volatile organic analysis performed that day. QC check samples containing all analytes of interest will be either purchased commercially or prepared from pure standard materials independently from calibration standards. The QC check sample will be analyzed and evaluated according to criteria in the method. Instrument performance check standards and calibration blank results will be recorded in a laboratory log book, which will also contain evaluation parameters, benchmark criteria, and maintenance information (see Section 11.0).

7.0 ANALYTICAL PROCEDURES

The EPA methods have established detection limits (and, in some cases, quantification limits) covering each analyzed constituent for use nationwide as a contractual requirement for analytical laboratories. Quantification limits were established after considering typical ranges of interferences affecting quantification of constituents in representative environmental samples. Quantification of constituents at levels below the established quantification limits may be achieved if interferences are not significant. For highly contaminated samples, matrix effects may result in higher quantification limits being necessary.

General methods and method quantification limits for analyses to be performed are summarized in Table QA-7.1. Methods for analysis will include analytical procedures commonly employed by the project laboratory and verified as to accuracy and precision. QC checks and decision criteria for determining if an analysis is within quality control requirements will follow the guidelines given in the method.

Where appropriate and consistent with anticipated data uses and with recognition of the validation requirements, these procedures may be modified to incorporate techniques familiar to the project laboratory with agreement from Spokane County. Deviations from EPA methods must be substantiated by full data verification and validation procedures according to requirements presented in the EPA 530 SW-87-008 Test Method Equivalency Petitions manual (EPA 1987c). Any such procedure deviations deemed significant by Spokane County will be submitted to the EPA and Ecology for review and concurrence prior to implementation.

TABLE QA-6-1
FIELD ANALYSES
QUALITY CONTROL LIMITS

Parameter	Units	Accuracy	Precision
pH unit	Standard pH units	± 0.1 pH unit	± 0.1 pH
Specific Conductance	umhos/cm	$\pm 5\%$	$\pm 5\%$
Temperature	degrees C	$\pm 0.1^{\circ}\text{C}$	$\pm 0.1^{\circ}\text{C}$
Water Level Indicator	inches	± 0.01 inch	± 0.01 inch

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7.0 ANALYTICAL PROCEDURES

The EPA methods have established detection limits (and, in some cases, quantification limits) covering each analyzed constituent for use nationwide as a contractual requirement for analytical laboratories. Quantification limits were established after considering typical ranges of interferences affecting quantification of constituents in representative environmental samples. Quantification of constituents at levels below the established quantification limits may be achieved if interferences are not significant. For highly contaminated samples, matrix effects may result in higher quantification limits being necessary.

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Where appropriate and consistent with anticipated data uses and with recognition of the validation requirements, these procedures may be modified to incorporate techniques familiar to the project laboratory with agreement from Spokane County. Deviations from EPA methods must be substantiated by full data verification and validation procedures according to requirements presented in the EPA 530 SW-87-008 Test Method Equivalency Petitions manual (EPA 1987c). Any such procedure deviations deemed significant by Spokane County will be submitted to the EPA and Ecology for review and concurrence prior to implementation.

TABLE QA-7.1

METHODS AND QUANTIFICATION LIMITS FOR
ANALYSIS OF GROUND WATER

Analyte	Technique	Analysis Method	Quantification Limit
Organic Priority Pollutants			
Volatile Organics	GC/HSD	SW 8010 ^(a)	
Constituents of Concern			
1,1,1-Trichloroethane			0.3 ug/L
1,1-Dichloroethylene			1.3 ug/L
1,1-Dichloroethane			0.7 ug/L
Trichloroethylene			1.2 ug/L
Tetrachloroethylene			0.3 ug/L
Methylene Chloride			<2.5 ug/L
Other Volatile Organics			
Benzyl chloride			(b)
Bis (2-chloroethoxy)methane			(c)
Bromobenzene			(d)
Bromodichloromethane			1.0 ug/L
Bromoform			2.0 ug/L
Bromomethane			(d)
Carbon tetrachloride			1.2 ug/L
Chlorobenzene			2.5 ug/L
Chloroethane			5.2 ug/L
2-Chloroethyl vinyl ether			1.3 ug/L
Chloroform			0.5 ug/L
1-Chlorohexane			(d)
Chloromethane			0.8 ug/L
Chloromethylmethyl ether			(c)
Chlorotoluene			(d)
Dibromochloromethane			0.9 ug/L
Dibromomethane			(d)
1,2-Dichlorobenzene			1.5 ug/L
1,3-Dichlorobenzene			3.2 ug/L
1,4-Dichlorobenzene			2.4 ug/L
Dichlorodifluoromethane			(b)
1,2-Dichloroethane			0.3 ug/L
trans-1,2-Dichloroethylene			1.0 ug/L
1,2-Dichloropropane			0.4 ug/L
trans-1,3-Dichloropropylene			3.4 ug/L
1,1,2,2-Tetrachloroethane			0.3 ug/L
1,1,1,2-Tetrachloroethane			(d)
1,1,2-Trichloroethane			0.2 ug/L
Trichlorofluoromethane			(d)
Trichloropropane			(d)
Vinyl chloride	QA-7-2		1.8 ug/L

TABLE QA-7.1 (continued)

METHODS AND QUANTIFICATION LIMITS FOR
ANALYSIS OF GROUND WATER

Analyte	Technique	Analysis Method	Quantification Limit
Field Parameters			
pH	Electrometric	SW 9040	0.1 pH unit
Conductivity	Specific Conductance	SW 9050	1 umho/cm
Temperature	Thermometric	EP 170.1 ^(e)	0.2 C

(a) SW = Test Methods for Evaluating Solid Waste (SW-846), 3rd edition, EPA 1986a.

(b) Demonstrated erratic results when tested by purge-and-trap.

(c) Demonstrated poor purging efficiency.

(d) Quantification limit not listed in Method 8010.

(e) EP = Methods for Chemical Analysis of Water and Wastes, EPA 1983.

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8.0 DATA REDUCTION, VALIDATION, AND REPORTING

All analyses performed for this project must be accompanied by sufficient QC results to enable reviewers to conclusively determine the quality of the data. Spokane County is responsible for conducting checks for internal consistency, transmittal errors, laboratory protocols, and for complete adherence to the QC elements specified in this QAPjP.

Field measurements (ground water level, pH, conductivity, and temperature) will be verified and checked through review of measurement and recording procedures during surveillance of field and instrumentation calibration procedures. Transfer of field data from field notebooks to raw data lists will be verified by Spokane County.

Analytical data will be reported in the units specified in Table QA-7.1. These units have been selected to assure ease of comparison with previously generated relevant site data and human health criteria.

The laboratory will provide documentation including the sample results with appropriate annotations, and all QA/QC results associated with that sample set (blanks, laboratory duplicates, matrix spikes, matrix spike duplicates, laboratory control samples, and surrogate recoveries). Raw data will not be required for all samples; however, the laboratory will maintain this information in their files. Data validation procedures for samples will include checking the following:

- Holding times,
- Field trip blanks
- Field rinsate blanks
- Field transfer blanks
- Blind field duplicates
- Laboratory matrix spikes
- Laboratory matrix spike duplicates
- Method blanks
- QC check samples
- Surrogate recoveries
- Detection limits
- Assessment of precision

- Assessment of accuracy
- Assessment of completeness.

Section 12.0 presents statistical tests used to determine data precision, accuracy, and completeness. If precision or accuracy fall outside of established acceptance limits, re-analysis or corrective action will be implemented as appropriate. All corrective action will be substantial and defensible, or the corrected data will not be used. Corrective action procedures are presented in Section 13.0.

9.0 INTERNAL QUALITY CONTROL

QC checks will consist of measurements performed in the field and laboratory. Analytical procedures referenced in Section 7.0 specify routine methods required to evaluate whether data are within proper QC limits. Additional QC checks include analysis of a number of field and laboratory QC samples, which are described in the following subsections.

9.1 FIELD/INTRALABORATORY METHODS

The following QC samples will be evaluated to verify accuracy and precision of analytical results for this investigation. The frequency of laboratory and field QC analysis is described herein. The frequency of QC sample collection is specified on a percentage basis.

9.1.1 Field Trip Blank

The field trip blanks for ground water sampling will consist of a deionized (DI)/ distilled water blank (supplied by the analytical laboratory), which will be transported to and from the field, then returned to the laboratory unopened and unaltered for volatile organics analysis to determine possible container contamination. A minimum of 5 percent of the total number of ground water samples will be sent to the laboratory as field trip blanks.

9.1.2 Blind Field Duplicate

The field duplicate for ground water sampling will consist of two water samples collected sequentially. Samples will be coded such that the laboratory cannot discern from the sample label which samples are duplicates. Field duplicate samples will be collected at a rate of 5 percent of the total number of samples collected for volatile organics analysis.

9.1.3 Laboratory Matrix Spike

For ground water samples, a minimum of one laboratory matrix spike will be analyzed per 20 samples (or one per sampling event, if fewer than 20 samples are obtained) for volatile organics. The laboratory matrix spike will follow EPA matrix spike guidelines specified in the EPA Method.

9.1.4 Laboratory Matrix Spike Duplicate

For ground water samples, a minimum of one laboratory matrix spike duplicate will be analyzed per 20 samples (or one per sampling event, if fewer than 20 samples are obtained) for volatile organics. The laboratory duplicate matrix spike will follow EPA duplicate matrix spike guidelines specified in the EPA methods.

9.1.5 Laboratory Method Blank

A minimum of one laboratory method blank will be analyzed for all parameters per 20 samples, one every 12 hours, or one per batch of samples analyzed (if fewer than 20 samples are analyzed) to assess possible laboratory contamination. Dilution water will be used whenever possible. Method blanks will contain all reagents used for analysis.

9.1.6 QC Check Sample

For volatile organic analyses, a minimum of one QC check sample containing each analyte of interest will be analyzed per 20 samples or one per sampling event (if fewer than 20 samples are obtained) to verify accuracy of laboratory equipment. Analysis will follow guidelines established in the EPA method.

9.2 INTERLABORATORY COMPARISONS

No interlaboratory comparisons will be required. Accuracy of the analyses will be evaluated based on the results of the blanks, matrix spikes, and QC check sample analyses.

10.0 PERFORMANCE AND SYSTEM AUDITS

This section presents the internal performance and systems audits required to monitor performance of the field measurement systems. Performance and system audits of sampling activities will consist of direct observations of work being performed, and inspection of sampling equipment use, calibration, and maintenance to verify adherence to QA/QC requirements.

Internal audits of field activities will be conducted by Spokane County annually. Audits will be unannounced to assure representative performance of technical and QA procedures. Audits will be conducted only by individuals that have no direct responsibilities for the activities being audited.

Prior to internal audits, the auditor(s) will meet with the audited party to define the scope of the audit. The physical audit will consist of reviewing audited activities, completing the checklist, and noting any nonconformances, deficiencies, and relevant observations. An exit review will be conducted with the audited party to notify them of preliminary audit findings.

The auditor or designee will prepare an audit report that includes findings, nonconformances, observations, recommended corrective action, and a schedule for completion of such action.

11.0 PREVENTIVE MAINTENANCE

11.1 FIELD INSTRUMENTS

The Spokane County Representative at each well site is responsible for field instrumentation preventive maintenance. Preventive maintenance on field instruments will be performed by qualified field technicians in accordance with manufacturer's instructions and maintenance schedules. Maintenance will be documented in instrument log books, and will include the date and initials of individual performing the maintenance.

The Spokane County Representative will routinely compare instrument calibration results against preventive maintenance records to verify the effectiveness of the preventive maintenance program. The Spokane County Representative is responsible for scheduling preventive maintenance required by the manufacturer.

11.2 LABORATORY INSTRUMENTS

The analytical laboratory manager has ultimate responsibility for maintaining laboratory instruments in good working order, including responsibilities for routine maintenance and the training of personnel in maintenance procedures. All maintenance activities and other appropriate details will be documented daily in maintenance log books by the laboratory personnel performing the maintenance. Each entry will be signed and dated. At a minimum, the preventative maintenance schedules contained in the EPA methods and in the equipment manufacturer's instructions will be followed.

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA

Analytical data will be reviewed to assure that the QA/QC objectives for precision, accuracy, and completeness are met. These reviews are intended to identify the occurrence of deficiencies in time to take corrective action. This section describes routine procedures for assessing project data.

12.1 ASSESSMENT OF PRECISION

Precision measures the mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. QA/QC sample types that test precision include field duplicates and matrix spike duplicates. The estimate of precision of duplicate measurements is expressed as a relative percent difference (RPD), and is calculated as follows:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

Where D_1 = First sample value

D_2 = Second sample value (duplicate)

The RPDs will be routinely calculated and compared with DQOs.

To set control limits, the standard deviation, s , of a series of replicate measurement limits is calculated:

$$s = \sum_{i=1}^n \left[\frac{(X_i - \bar{X})^2}{n-1} \right]^{1/2}$$

Where: s = the sample standard deviation

n = the number of replicates

X_i = the i th replicate

\bar{X} = the mean of the replicates.

12.2 ASSESSMENT OF ACCURACY

Accuracy is assessed using results of surrogate recoveries, QC check samples, and matrix spike analyses and is routinely expressed as a percent recovery, which is calculated:

$$\text{Percent Recovery} = \frac{(\text{Total Analyte Found} - \text{Analyte Originally Present}) \times 100}{\text{Analyte Added}}$$

The percent recovery will be routinely calculated and checked against data quality objectives.

12.3 ASSESSMENT OF COMPLETENESS

The amount of valid data produced will be compared with the total analyses performed to assess the percent of completeness. Completeness will be routinely calculated and compared with DQOs.

13.0 CORRECTIVE ACTIONS

Corrective actions may be needed for two categories of non-conformance:

- Deviations from the methods or QA requirements established in the QAPjP
- Equipment or analytical malfunctions.

Corrective action procedures that might be implemented based on audit results or detection of unacceptable data are developed on a case-by-case basis. Such actions may include one or more of the following:

- Altering procedures in the field
- Using a different batch of containers
- Performing an additional audit of field or laboratory procedures
- Reanalyzing samples if holding times allow
- Resampling and analyzing
- Evaluating sampling and analytical procedures to determine possible causes of the discrepancies
- Accepting the data with no action, acknowledging the level of uncertainty
- Rejecting the data as unusable.

During field operations and sampling procedures, the Spokane County Representative will be responsible for taking and reporting required corrective action. A description of any such action taken will be entered in the Field Log Book. If field conditions are such that conformance with the QAPjP is not possible, the Spokane County QAC will be consulted immediately. Any corrective action or field condition resulting in a major revision of the QAPjP or Field Sampling Plan will be communicated to the County Project Manager as well as EPA and Ecology for review and concurrence. This communication will be made prior to changes in the field activities whenever possible.

During laboratory analysis, the Laboratory QA Officer will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet data quality goals outlined in this QAPjP, corrective action will follow the guidelines in the EPA

methods and the EPA guidelines for data validation for organics and inorganics (EPA 1988a, 1988b). At a minimum, the laboratory QA officer will be responsible for monitoring the following:

- Calibration check compounds must be within performance criteria specified in the EPA method or corrective action must be taken prior to initiation of sample analysis. For volatile organics analysis in water (Method 8010), a minimum of five calibration standards will be prepared for each analyte of interest. One of the standards should be at a concentration near, but above, the method quantification limit. The other concentrations should correspond to the expected range of concentrations found in real samples or should define the working range of the detector. The percent relative standard deviation cannot exceed 20 percent when comparing calibration factors to determine if the five-point calibration curve is linear. The working calibration curve or calibration factor must be verified on each working day by the injection of one or more calibration standards. If the response for any analyte varies from the predicted response by more than $\pm 15\%$, a new calibration curve must be prepared for that analyte. No analyses may be performed until these criteria are met.

- Before processing any samples, the analyst should demonstrate, through analysis of a reagent blank, that interferences from the analytical system, glassware, and reagents are within acceptable limits. Each time a set of samples is extracted or there is a change in reagents, a reagent water blank should be processed as a safeguard against chronic laboratory contamination. The blank samples should be carried through all stages of the sample preparation and measurement steps.

For volatile organics analysis, blanks must contain less than 2.5 g/L methylene chloride. For other target compounds, blanks must contain less than the specified quantification limit. For other parameters, method blanks must be below criteria guidelines specified in the method. If contaminants are present above these levels, the source of contamination must be investigated, corrective action taken and documented, and all samples associated with a contaminated blank re-analyzed. If, upon re-analysis, blanks do not meet these requirements, Spokane County will be notified immediately to discuss whether analyses may proceed.

- Retention time windows will be defined by plus or minus three times the standard deviation of the absolute retention times for each standard. The laboratory must calculate retention time windows for each standard on each GC column and whenever a new GC column is installed. The data must be retained by the laboratory. All succeeding standards in an analysis sequence must fall within the daily retention time window established by the first standard of the sequence. No analyses may proceed until this criterion is met.

- Surrogate spike analysis for volatile organics must be within the specified range for recovery limits or corrective action must be taken and documented. Corrective action includes: 1) reviewing calculations, 2) checking surrogate solutions, 3) checking internal standards, and 4) checking instrument performance. Subsequent action could include recalculating the data and/or re-analyzing the sample if any of the above checks reveal a problem. If the problem cannot be corrected through re-analysis, the Spokane County QAC will be notified by the laboratory prior to data submittal, so that additional corrective action can be taken, if appropriate.

If the recovery of a surrogate compound in the method blank is outside the recovery limits, the blank will be re-analyzed along with all samples associated with that blank. If the surrogate recovery is still outside the limits, the Spokane County QAC will be notified immediately to discuss whether analyses may proceed.

- If holding times are exceeded, all positive and non-detected results will be qualified as estimated concentrations. If holding times are grossly exceeded, the Landau QAC may determine the data to be unusable.
- If laboratory instrumentation deviates from required calibration specifications, the Spokane County QAC will either flag data as estimated or determine it to be unusable, according to guidelines established by EPA (EPA, 1988a, 1988b).
- If the concentrations detected in the back sorbent section of air samples are greater than 10 percent of those in the front sorbent section, breakthrough and possible sample loss will be assumed. Data will be flagged as estimated.

If analytical conditions are such that non-conformance with this QA plan is indicated, the Spokane County QAC will be notified as soon as possible, so that any additional corrective actions can be taken.

Corrective action reports will be used to document response to reported non-conformances. These reports may be generated from internal or external audits or from informal reviews of project activities (Section 12.0).

Corrective action reports initially will be reviewed for appropriateness of recommendations and actions by Spokane County.

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

All data packages reported to EPA and Ecology will include results of the QA workups and conclusions. This QA report will summarize all relevant data quality information. Spokane County will be responsible for data quality assessments and associated QA reports.

QA audit reports will be prepared and submitted to the County Project Manager. Final task or investigative reports will contain a separate QA section summarizing data quality information.

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APPENDIX QA-A
FIELD SAMPLING PLAN

FIELD SAMPLING PLAN
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1.0 INTRODUCTION

This Field Sampling Plan (FSP) has been prepared in conjunction with the Quality Assurance Project Plan (QAPjP) to address sampling activities for the Residential Well Sampling Program. The QAPjP should be referred to for a discussion of the site history and project background. A regional location map of the Colbert Landfill vicinity is provided on Figure FS-1.1.

The purpose of the FSP is to provide detailed information on the procedures to be implemented when obtaining samples of ground water from domestic wells at the Colbert Landfill Superfund site. These procedures are intended to be consistent with the data quality objectives set forth in QAPjP Sections 1.0, 2.0, and 3.0.

FIGURE FS-1.1

Regional Location Map at Colbert Landfill Site

2.0 SAMPLING OBJECTIVES

The objective of the FSP is to assure that accurate, reproducible, comparable, and consistent data are acquired from the Colbert domestic wells. To achieve this objective, this document details sample collection, handling, documentation, and security procedures. These procedures have been written to comply with the Compendium of Superfund Field Operations (EPA/540/P-87/ 001, OSWER 9355.014, September 1987a), and to meet the DQOs described in Section 1.3 of the QAPjP. Standards have been developed for evaluation of the field sampling procedures with respect to the project objectives.

Any changes in sampling procedures as outlined in this document will be described on the Modification to Field Sampling Plan form (Figure FS-2.1). Approval from Spokane County will be needed prior to implementation of any changes.

FIGURE FS-2.1

Modification to Field Sampling Plan

3.0 SAMPLE LOCATION AND FREQUENCY

Ground water samples will be collected from domestic wells in the Colbert area. Sampling efforts are performed for the purposes of:

- (1) Geologic/hydrogeologic characterization,
- (2) Ground water quality characterization (including contamination distribution), and
- (3) Providing water quality information to Colbert residences.

Ground water samples will be field tested for temperature, pH, and conductivity, and subsequently analyzed for chlorinated volatile organics. Analysis for sampling rounds will be abbreviated to the six "Constituents of Concern" (1,1,1-trichloroethane [TCA], 1,1-dichloroethylene [DCE], 1,1-dichloroethane [DCA], trichloroethylene [TCE], tetrachloroethylene [PCE], and methylene chloride [MC]), except for locations where a sampling event indicates that other volatile organic compounds are present at significant concentrations.

4.0 SAMPLING EQUIPMENT AND PROCEDURES

This section presents the required equipment and step-by-step procedures for ground water sampling. A summary of sample containers, preservation requirements, and holding times is presented in Table FS-4.1.

Ground water monitoring well sampling will be performed at each residential well in accordance with the procedures described in the following subsections.

4.1 WATER LEVEL MEASUREMENTS

Water levels will be measured just prior to purging and sampling with an electronic water level indicator. Measurements will be taken from the surveyed point on the top of the PVC well casing. If a non-dedicated water level probe is used, it will be decontaminated before and after each measurement with a distilled water rinse. Depth to water will be recorded to the nearest 0.01 foot on the Sample Collection Form (Figure FS-4.1).

4.2 PURGING THE WELL

The well will be purged by removing at least three well volumes of water, or as approved by the Colbert Sampling Committee and Spokane County, from the casing using a gas-driven, piston, or bladder pump fitted with teflon-lined polyethylene or stainless steel tubing. If the pump is non-dedicated, it will be washed with an Alconox and water solution, rinsed with tap water, and then rinsed with distilled water.

The well purge volume will be calculated based on the following formula: one well volume (gallon) = $\pi r^2 h \times 7.48 \text{ gal/ft}^3$; where $\pi = 3.14$, r = radius of well casing in feet, h = height of water column from the bottom of the well in feet. In most instances, sampling will be completed the same day as well purging. However, if the well becomes dry during purging, it will be sampled as soon as the water level has recovered enough to allow collection of the necessary samples, which may require sampling on a subsequent day. The elapsed time between purging and sampling will be recorded on the Sample Collection Form.

4.3 GROUND WATER SAMPLING EQUIPMENT

Samples will be collected with the aid of a bladder pump, piston pump, or bailer (stainless steel or teflon). If the pump or bailer is non-dedicated, it will be washed with an

TABLE FS-4.1

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Matrix	Bottle ^(a) Code	Analyses	Sample Container	Preservation	Holding ^(b) Time
Ground Water	V	Volatiles	2 ea - 40 mL glass vials (leave no headspace) Teflon-lined septum cap	Cool, 4° C	14 days

(a) Bottle code to follow sample station number.

(b) Holding times are from date of collection. All samples will be shipped to the laboratory within 24 hours (except as noted for samples collected on Friday).

FIGURE FS - 4.1

Sample Collection Form

Name: _____ Date: _____ PURGE: _____
 Lab No: _____ RATE: _____
 Address: _____ Project: KTC/County TIME: _____
 Location: Colbert
 Area _____ Work By: _____

Phone: _____

Well Location: _____

Well Data: Conductivity _____ @ _____ Deg C Range _____

Sampling: Water started: ____:____ Est. Flow Rate _____gpm
Time sampled: ____:____ Water volume purged: _____

Sample taken at: _____

Sample taken prior to pressure tank: Yes No

SWL Measured: Depth from TOC (not cap) Plug access: Yes

_____ feet _____:_____ time _____ feet _____:_____ time
feet : time feet : time

Reported by: _____ Well Depth: _____ SWL: _____
Pump set @: _____ Pump rate: _____ gpm

Land Surface	Survey Mark	Top of Casing(TOC)not cap
--------------	-------------	---------------------------

Background:

Date Last updated:

Previous Sampling point:

Type of pressure tank:

System configuration:

Special Equipment required:

Alconox and water solution, rinsed with tap water, and then rinsed with distilled water following use. The pump (or bailer) will also be rinsed with distilled water prior to use at a new location.

The following precautions will be followed when using a non-dedicated pump or bailer to collect ground water samples:

- The pump or bailer will be lowered slowly into the well, and
- The pump or bailer will not be allowed to come into contact with any surface other than the inside of the well.

4.4 SAMPLE CONTAINERS

Certified sample containers which have been cleaned to EPA specifications will be obtained from a bottle-supply firm through the analytical laboratory; the laboratory will add the proper preservatives to the appropriate containers prior to sample collection.

4.5 SAMPLE LABELS

Sample labels are necessary to properly identify samples. Gummed paper labels or tags are adequate and will include the following information:

- Sample identification number
- Date and time
- Name of sampler
- Pertinent field information.

Labels will be completed and affixed to sample containers prior to or at the time of sampling.

4.6 FIELD MEASUREMENTS

Calibration - Conductivity and pH meters will be calibrated following the manufacturer's procedures provided with the instruments. Calibration will be accomplished daily. Calibration adjustments will be recorded in a log book maintained for each meter. Before the day's sampling event, the calibration will be checked by measuring the pH 7 buffer solution and recording that reading and the temperature on the Sample Collection Form. If readings are within 0.1 pH units of the pH 7 buffer, no recalibration is needed.

Measurements - Two replicate field measurements of pH and conductivity will be made using the following procedure:

- Rinse a 250 milliliter (ml) plastic beaker with sample water
- Rinse the electrode, dip cell, and temperature compensation probe by storing them in sample water for at least one minute
- Set the automatic temperature compensator to the "on" position
- Fill the beaker with sample water; place the probes in the beaker until the reading stabilizes. Read the temperature, pH, and conductivity measurements and record on the Sample Collection Form
- Measure and record additional sample replicate by repeating this last step; rinse beaker with distilled water and an aliquot of the sample water to be measured between each measurement
- Note any problems or significant observations in the "comments" section of the Sample Collection Form (Figure FS-4).

4.7 FILLING SAMPLE BOTTLES

Sample bottles will be filled directly from the bailer or pump, and will be filled with a minimal amount of air contact when sampling for volatile organics. The flow rate from the pump or bailer should be adjusted to approximately 100 milliliters per minute, and should be a slow steady stream.

The following procedures and precautions will be adhered to when filling sample bottles:

- Bottle caps will be removed carefully so that the inside of the cap is not touched. Caps will not be placed on the ground. Caps for volatile organics analyses contain a teflon-lined septum. The teflon side of the septum must be facing the sample to prevent contamination of the sample through the septum.
- The sample bottles will be filled with a minimal amount of air contact and without allowing the sampling equipment or personnel to contact the inside of the bottles. Tubing or hoses from pumps will not be placed into the sample bottles.
- Sample bottles containing preservatives should be filled completely without allowing any sample to overflow the top of the bottle. Bottle caps should be replaced tightly.
- Vials for volatile organics analyses will be filled so that they are headspace-free (i.e., no air bubbles in the sample bottle). The caps will be replaced gently, so as to eliminate any air bubbles in the sample. These bottles will then be checked for air bubbles by inverting them and shaking the bottle. If any air bubbles appear, the bottles will be opened, drained, and refilled. This process will be repeated until all air bubbles are eliminated.

- Each sample bottle will be placed in a plastic bag. Samples should be placed into an iced cooler immediately after collection. Loss of volatile organics may occur by exposure to sunlight and warm temperatures.

5.0 SAMPLE HANDLING AND ANALYSIS

Sample container description, preservation method, and the maximum holding time for analysis are presented for each sample type in Table FS-4.1.

Samples will be shipped to the laboratory Monday through Thursday. Samples will not be shipped on Friday.

Samples collected on Friday will typically be stored in a refrigerated area over the weekend, and shipped to the laboratory on Monday.

All samples except those that are preserved with acid (nitrate, COD, TOC, TOX, and metals) will be sent to the laboratory as environmental samples. Environmental samples will be shipped as follows:

Each sample will be placed in a separate plastic bag. A picnic cooler will be used as a shipping container. In preparation for shipping samples, the drain plug will be taped shut from the inside and outside, and a large plastic bag will be used as a liner for the cooler. Approximately 1 inch of packing material, such as asbestos-free vermiculite, will be placed in the bottom of the liner. The sample bottles will be placed in the lined cooler. All coolers will contain ice or frozen gel packs. The lined cooler will be filled with packing material, and the large liner bag will be taped shut. Sufficient packing material will be used to prevent sample containers from making contact during shipment. The paperwork going to the laboratory will be placed inside a plastic bag and taped inside the cooler lid.

The cooler will be taped shut with strapping tape. Chain-of-Custody seals will be placed on the cooler (Figure FS-4.3). The cooler will either be shipped on an overnight carrier or transported by automobile.

Samples preserved with acid will either be transported directly to the laboratory by automobile, or will be shipped on an overnight carrier (cargo aircraft only) as hazardous samples. If these samples are shipped on an overnight carrier, they will be packaged as follows:

Each sample bottle will be placed in a separate plastic bag. As much air as possible is squeezed from the bags before sealing. Each bottle will be placed in a separate paint can. The paint can will be filled with vermiculite, and the lid will be fixed to the can. The lid will be sealed with metal clips or with filament tape. Arrows will be placed on the can to indicate which end is up. The outside of the

can will contain the proper Department of Transportation (DOT) shipping name and identification number for the sample as given by 49 CFR-171-177. The information will be printed legibly. The cans will be placed upright in the cooler that has had its drain plug taped shut inside and out, and that has been lined with a large plastic bag. The bag liner will be partially filled with vermiculite, and will then be taped shut.

The paperwork going to the laboratory will be placed inside a plastic bag and taped to the inside of the cooler lid. The cooler will be closed and sealed with strapping tape. At least two custody seals will be placed on the outside of the cooler (one in front and one on the back). The following markings will be placed on the top of the cooler:

- Proper shipping name (49 CFR 172.301)
- DOT identification number (49 CFR-172.306)
- Shipper's name and address (49 CFR-172.306)
- Corrosive Liquid, N.O.S.
- "Cargo Aircraft Only."

An arrow symbol indicating "This Way Up" will be placed on the cooler in addition to the markings and labels described above. A restricted article airbill will be used for shipment.

APPENDIX QA-B

FIELD OPERATIONS AUDIT CHECKLIST

FIELD CHECKLIST
Field Observations

- Yes__ No__ N/A__ 1. Was permission granted to enter and inspect the facility?
(Required if RCRA inspection.)

- Yes__ No__ N/A__ 2. Is permission to enter the facility documented? If yes, where
is it documented?

- Yes__ No__ N/A__ 3. Were split samples offered to the facility? If yes, was the offer
accepted or declined?

- Yes__ No__ N/A__ 4. Is the offering of split samples recorded? If yes, where is it
recorded?

- Yes__ No__ N/A__ 5. If the offer to split samples was accepted, were the split
samples collected? If yes, how were they identified?

- Yes__ No__ N/A__ 6. Are the number, frequency, and types of field measurements
and observations taken as specified in the project plan or as
directed by the project coordinator? If yes, where are they
recorded?

- Yes__ No__ N/A__ 7. Are samples collected in the types of containers specified for
each type of analysis? If no, what kind of sample containers
were used?

Yes__ No__ N/A__ 8.

Are samples preserved as required? If no or N/A, explain.

Yes__ No__ N/A__ 9.

Are the number, frequency, and types of samples collected as specified in the project plan or as directed by the project coordinator? If no, explain why not.

Yes__ No__ N/A__ 10.

Are samples packed for preservation when required (i.e., packed in ice, etc.)? If no or N/A, explain why.

Yes__ No__ N/A__ 11.

Is sample custody maintained at all times? How?

FIELD CHECKLIST
Document Control

- | | | | |
|------------------|----|---|-------------------|
| Yes__ No__ N/A__ | 1. | Have all unused and voided accountable documents been returned to the coordinator by the team members? | <hr/> <hr/> <hr/> |
| Yes__ No__ N/A__ | 2. | Were any accountable documents lost or destroyed? If yes, have document numbers of all lost or destroyed accountable documents been recorded and where are they recorded? | <hr/> <hr/> <hr/> |
| Yes__ No__ N/A__ | 3. | Are all samples identified with sample tags? If no, how are samples identified? | <hr/> <hr/> <hr/> |
| Yes__ No__ N/A__ | 4. | Are all sample tags completed (e.g., station no., location, date, time, analyses, signatures of samplers, type, preservatives, etc.)? If yes, describe types of information recorded. | <hr/> <hr/> <hr/> |
| Yes__ No__ N/A__ | 5. | Are all samples collected listed on a chain-of-custody record? If yes, describe the type of chain-of-custody record used and what information is recorded. | <hr/> <hr/> <hr/> |
| Yes__ No__ N/A__ | 6. | If used, are the sample tag numbers recorded on the chain-of-custody documents? | <hr/> <hr/> <hr/> |
| Yes__ No__ N/A__ | 7. | Does information on sample tags and chain-of-custody records match? | <hr/> <hr/> <hr/> |

Yes__ No__ N/A__ 8.

Does the chain-of-custody record indicate the method of sample shipment?

Yes__ No__ N/A__ 9.

Is the chain-of-custody record included with the samples in the shipping container?

Yes__ No__ N/A__ 10.

If used, do the sample traffic reports agree with the sample tags?

Yes__ No__ N/A__ 11.

If required, has a receipt for the samples been provided to the facility (required by RCRA)? Describe where offer of a receipt is documented.

Yes__ No__ N/A__ 12.

If used, are blank samples identified?

Yes__ No__ N/A__ 13.

If collected, are duplicate samples identified on sample tags and chain-of-custody records?

Yes__ No__ N/A__ 14.

If used, are spiked samples identified?

Yes__ No__ N/A__ 15.

Are logbooks signed by the individual who checked out the logbook from the project coordinator?

Yes__ No__ N/A__ 16. Are logbooks dated upon receipt from the project coordinator?

Yes__ No__ N/A__ 17. Are logbooks project-specific (by logbook or by page)?

Yes__ No__ N/A__ 18. Are logbook entries dated and identified by author?

Yes__ No__ N/A__ 19. Is the facility's approval or disapproval to take photographs noted in a logbook?

Yes__ No__ N/A__ 20. Are photographs documented in logbooks (e.g., time, date, description of subject, photographer, etc.)?

Yes__ No__ N/A__ 21. If film from a self-developing camera is used, are photos matched with logbook documentation?

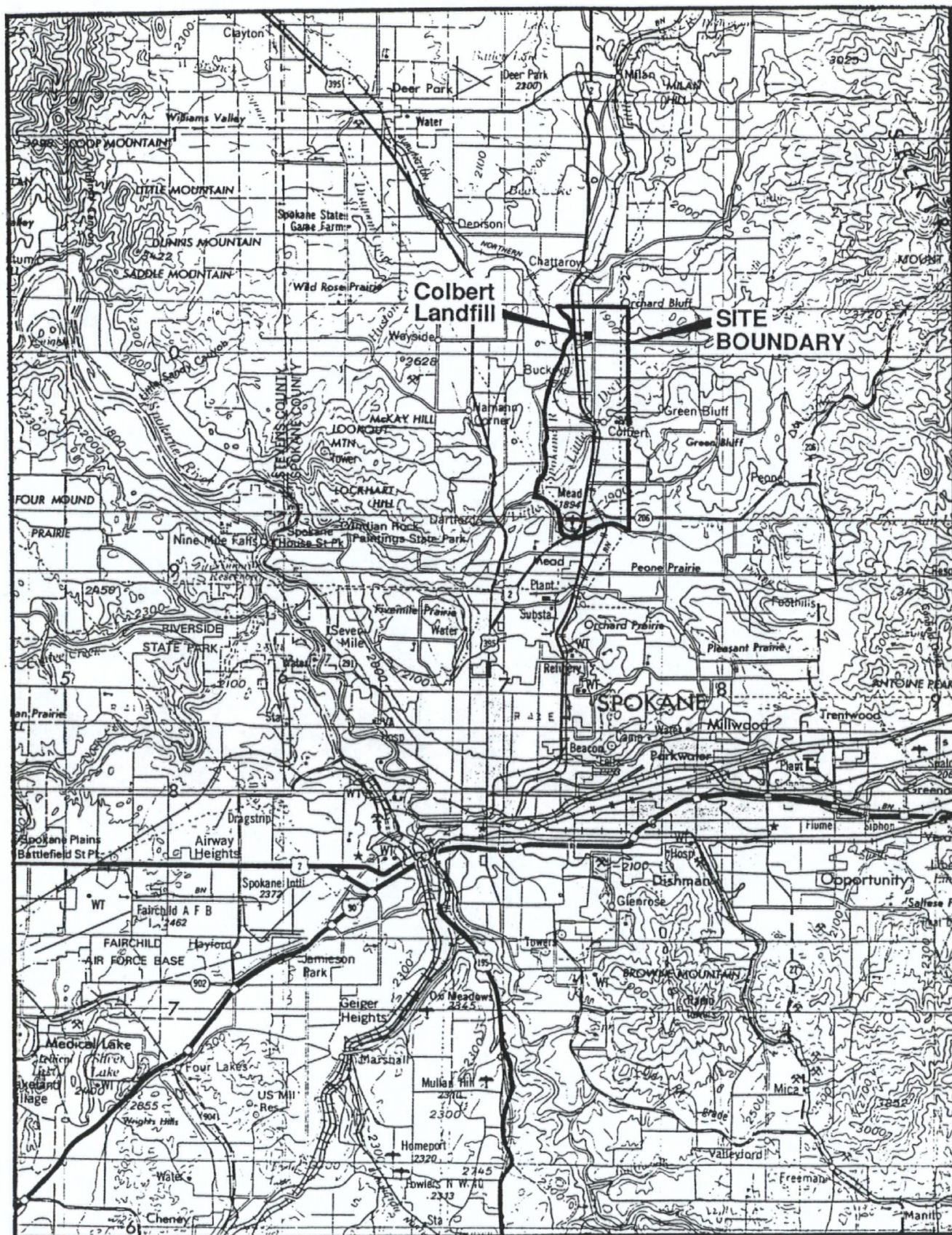
Yes__ No__ N/A__ 22. Are sample tag numbers recorded? If yes, describe where they are recorded.

Yes__ No__ N/A__ 23. Are calibration of pH meters, conductivity meters, etc., documented? If yes, describe where this is documented.

Yes__ No__ N/A__ 24.

Are amendments to the project plan documented? If yes,
describe where the amendments are documented.

[illegible]



Source: U.S.G.S. Topographic Map of Spokane, Washington; Idaho; Montana, 1980, modified by Landau Associates, Inc.

Regional Location Map of
Colbert Landfill Site

Figure FS-1.1

Modification To Field Sampling Plan

Sample Program Identification: _____

Material to be Sampled: _____

Measurement Parameter: _____

Standard Procedure for Analysis: _____

Reference: _____

Variation from Standard Procedure: _____

Reasons for Variation: _____

Special Equipment, Material or Personnel Required: _____

Author's Name: _____

Approval: _____ Title: _____ Date: _____

Reviewed by: _____

Comments: _____

Reviewed by: _____

Comments: _____

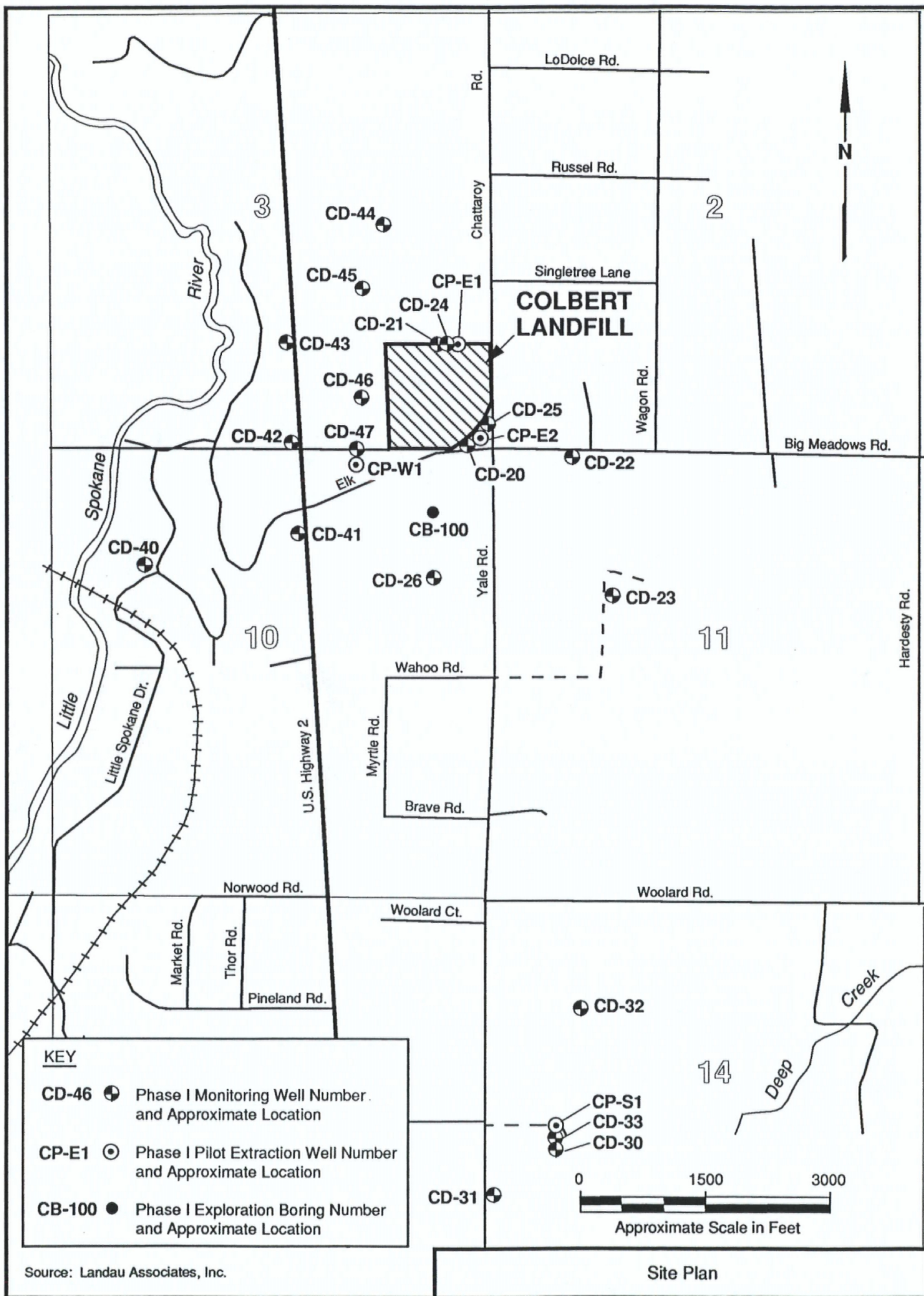


Figure QA-1.1

